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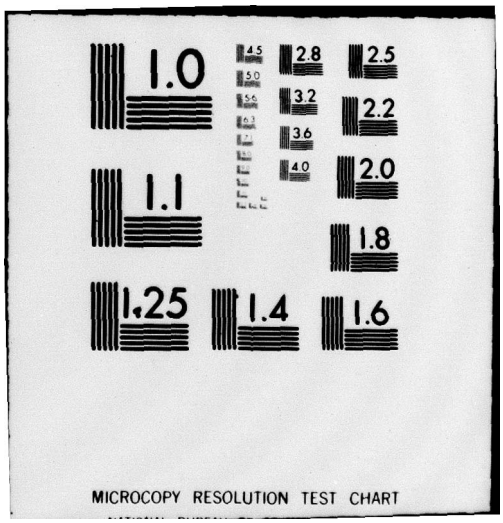
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Report SAM-TR-79-24

COMPARISON OF U.S.P. AND NON-U.S.P. GRADE IODINE-131: A PRELIMINARY REPORT

David Hunter, Captain, USAF, BSC
Robert E. Tatsch, B.S.

August 1979

Interim Report for Period February 1979 - April 1979

USAF SCHOOL OF AEROSPACE MEDICINE
Aerospace Medical Division (AFSC)
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NOTICES

This interim report was submitted by personnel of the Health Physics Branch, Radiation Sciences Division, USAF School of Aerospace Medicine, Aerospace Medical Division, AFSC, Brooks Air Force Base, Texas, under job order SUPTXHPS.

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This report has been reviewed by the Information Office (OI) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

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Airborne radioactivity, airborne concentrations, volatilization of I-131

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report compares the airborne radioactivity from a U.S.P. grade and a non-U.S.P. grade Iodine-131 liquid sample. The results from this report indicate that the non-U.S.P. grade I-131 has a significantly higher airborne radioactivity level than the U.S.P. grade I-131.

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COMPARISON OF U.S.P. AND NON-U.S.P. GRADE IODINE-131: A PRELIMINARY REPORT

INTRODUCTION

A significant thyroid uptake in individuals who open and prepare oral solutions of Iodine-131 for therapeutic doses has been reported (1). The uptake and concentration of the I-131 in the individual's thyroid gland appears to be due to breathing volatile iodine which is released when the cap of the container is removed. Pollock and Myser (2) reported iodine releases in the hospital elevator and hallways as I-131 was being transported from the nuclear pharmacy to the patient's room. This preliminary report compares the airborne radioactivity from millicurie quantities of U.S.P. grade and non-U.S.P. grade I-131 in the liquid form.

MATERIALS AND METHODS

A carbon-impregnated cellulose filter was counted with an Ortec model 6200 multichannel analyzer and a 1 3/4" X 2" sodium iodide (Tl) crystal. The air sampler used for this study was a Dupont model 4000 with a calibrated air flow of 4 liters per minute. The air sampler efficiency and calculations of airborne radioactivity were performed in the same manner as by Browning et al. (1). The vial containing the I-131 was positioned under the holder of the air sampler. With the vial cap removed, the air sampler was allowed to run for 10 minutes. The distance from the iodine vials was the same for all measurements. Table 1 summarizes the liquid I-131 sample results.

TABLE 1. U.S.P. AND NON-U.S.P. GRADE I-131

I-131	Total activity (mCi)	Volume (ml)	Concentration (mCi/ml)	Airborne radioactivity (μCi/ml)
U.S.P.*	70.5	10	7.05	---
U.S.P.*	70.5	10	7.05	1.18×10^{-10}
U.S.P.*	70.5	10	7.05	1.13×10^{-9}
Non U.S.P.+	100.0	4	25.00	2.11×10^{-7}
Non U.S.P.+	38.0	2	19.00	7.03×10^{-9}

*E.R. Squibb & Sons
+Mallinckrodt, Inc.

DISCUSSION

As can be seen from Table 1, the airborne concentration with the non-U.S.P. iodine is significant. The airborne radioactivity from the 100 mCi non-U.S.P. grade iodine was approximately 29 times greater than that from the 38 mCi--which did not exceed the airborne limits set by the Nuclear Regulatory Commission at 9×10^{-9} µCi/ml. Although limited by a maximum activity of 70.5 mCi, all of the U.S.P. grade iodine was well below these airborne radioactivity limits.

The data from this preliminary report indicate that the U.S.P. grade iodine has significantly less airborne radioactivity levels than the non-U.S.P. grade iodine. The non-U.S.P. grade iodine has a pH range between 2.0 and 4.0, while the U.S.P. grade iodine has a pH range between 7.5 and 9.0. Buffering the iodine solution at a pH between 7.5 and 9.0 maintains the preparation as sodium iodide, thereby preventing the volatilization of ^{131}I-hydriodic acid (3). Radiation hazards of personnel would be reduced by using U.S.P. grade iodine when therapeutic doses are required. The followup to this report will be conducted when the evaluation of higher activity levels of the U.S.P. grade I-131 is completed, both from the container and from breath samples of patients treated with therapeutic doses of 100 mCi or more of I-131.

REFERENCES

1. Browning, E. J., et al. Airborne concentration of I-131 in a nuclear medicine laboratory. Nucl Med 19:1078-1081 (1978).

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3. Stafford, R. E. R. Squibb and Sons, San Antonio, Texas. Personal communication, 1979.